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Indian Standard

SPECIFICATION FOR LAMPS FOR AERODROME LIGHTING FITTINGS

UDC 621·326 : 628·971·8 : 656·71

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1978

AMENDMENT NO. 1 JANUARY 1984

TO

IS : 8901 - 1978 SPECIFICATION FOR LAMPS FOR AERODROME LIGHTING FITTINGS

Alterations

(*Page* 6, *Table* 1, *col* 7) — Substitute the following for the existing column:

RATED LUMENS *Min*
(7)
360
650
620
1 050
1 260
2 100
4 400
4 200
4 300
4 300

(*Page* 6, *Table* 1, *Note* 2, *line* 2) — Substitute 'rated lumen values' *for* average lumen values '.

(*Page* 7, *clause* **4.3.1**) — Substitute the followining for the existing clause:

'**4.3.1** Average life shall not be less than the life stated in Table 1. However, it shall be subject to an allowance of 9 percent to take into account the relatively small size of the samples taken for life test.'

(*Page* 7, *foot-note with* '*' *mark*) — Delete.

(*Page* 8, *clause* **6.2, 6.3** *and* **6.4**) — Substitute the following for the existing clauses:

'**6.2 Inspection Test Quantity (ITQ)** — Inspection test quantity shall be as follows:

a) Normal for batch size up to and including 5 000 lamps	35
b) Special for batch size exceeding 5 000 lamps	70

6.3 Rating Test Quantity (RTQ) — From the lamps which have passed the inspection test, there shall be selected at random a RTQ as follows:

a) Normal for batch size up to and including 5 000 lamps	25
b) Special for batch size exceeding 5 000 lamps	50

6.4 Life Test Quantity (LTQ) — Form the lamps which have passed the rating test quantity, there shall be selected at random a life test quantity of 20 lamps both for normal as well as for special batch size.'

(*Page* 10, *clauses* **8.2** *and* **8.3**) — Substitute the following for the existing clauses:

'**8.2 Mechanical and Physical Requirements and Marking** — All the lamps chosen for ITQ as prescribed in **4.2** shall be tested for mechanical, physical and marking requirements (*see* **4.1** and **5**).

A batch shall be considered to comply with the requirements of this clause if the number of lamps failing does not exceed:

a) For normal batch having ITQ of 35 lamps:

  i) 3 for any one of the test (**4.1.1** to **4.1.3** and **5**), and

  ii) 7 for all the tests.

b) For special batch having ITQ of 70 lamps:

  i) 5 for any one of the tests (**4.1.1** to **4.1.3** and **5**), and

  ii) 12 for all the tests (**4.1.1** to **4.1.3** and **5**).

8.3 Initial Ratings — All the lamps chosen for RTQ shall be tested for initial wattage and lumen. A batch shall be considered to comply with the requirements of initial ratings if;

a) For a normal batch having RTQ of 25 lamps:

  i) the number of lamps where initial wattage is above the maximum values specified in Table 1, does not exceed 4; and

  ii) the number of lamps where lumen values are below the minimum values specified in Table 1, does not exceed 4.

b) For a special batch having RTQ of 50 lamps:

  i) the number of lamps whose lumen values are below the maximum value specified in Table 1, does not exceed 6; and

ii) the number of lamps whose lumen values are below the minimum values specified in Table 1, does not exceed 6.

[*Page* 10, *clause* **8.4**(b)] — Substitute the following for **8.4**(b):

'b) The number of lamps failing in respect of individual life and lumens of individual lamps at 50 percent of the nominal rated life does not exceed 5.'

(ETDC 23)

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Indian Standard

SPECIFICATION FOR LAMPS FOR AERODROME LIGHTING FITTINGS

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(*Continued on page* 15)

Indian Standard

SPECIFICATION FOR LAMPS FOR AERODROME LIGHTING FITTINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 July 1978, after the draft finalized by the Electric Lamps and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 The constant current lamps are normally used in a series system of aerodrome lighting and operate at a certain current regulated to remain constant. The filament arrangement in these lamps are such that on fitment to the light unit, the geometrical centre of the luminous system corresponds to the focus of the optical system of the light unit. This standard is intended to cover such lamps both for civil and military aerodromes.

0.3 In this standard vibration and thermal shock tests have not been included as the requirements and procedures for the tests, which would simulate the actual working conditions of the lamps in service, could not be finalized. It is intended to include these tests also in the standard at a later stage when sufficient data is available.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers constant current tungsten filament lamps of 6·6 A used for aerodrome lighting fittings.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 1885 (Part XVI/Sec 3)-1967† shall apply.

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*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary: Part XVI Lighting, Section 3 Lamps and auxiliary apparatus.

2.1 Type — Denotes lamps of the same general construction, which are intended to be identical in photometric and electrical ratings.

2.2 Batch — Denotes all the lamps of one type put forward in a lot at one time for acceptance or all the lamps of one type which are subjected on one occasion, to test for compliance with this standard.

2.3 Test Quantities

2.3.1 *Inspection Test Quantity* (*ITQ*) — The number of lamps selected from a batch according to an agreed method, the tests on which shall determine whether or not the batch complies with the mechanical and physical requirements specified in **4.1** and marking requirements specified in **5**.

2.3.2 *Rating Test Quantity* (*RTQ*) — The number of lamps selected from a batch according to an agreed method, the initial rating tests on which shall determine whether or not the batch complies with the initial rating requirements specified in **4.2**.

2.3.3 *Life Test Quantity* (*LTQ*) — The number of lamps selected from a batch according to an agreed method, the life test and measurements for individual lumens at specified hours on which shall determine whether or not the batch complies with the life performance requirements specified in **4.3**.

2.4 Light Centre Length (LCL) — The distance from the geometrical centres of the filament to the specified position of the cap.

2.5 Lumen — The unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source having an intensity of one candela.

NOTE — The candela (cd) is the unit of luminous intensity. It is of a magnitude such that the luminance of a full radiator at the temperature of solidification of platinum is 60 units of luminous intensity/cm^2.

2.6 Initial Readings — The photometric and electrical measurements made at the end of the ageing period (*see also* **7.2**).

2.7 Life of a Lamp — The number of hours it operates to burn-out or to the value specified in **4.3**.

2.8 Specified Life of a Lamp — The life of a lamp in hours as given in **4.3.1**.

2.9 Rated Current — The current marked on the lamp.

2.10 Rated Wattage — The wattage marked on the lamp.

2.11 Axial Error — The perpendicular distance of the light centre from the axis of the caps.

3. SHAPE AND DIMENSIONS OF BULBS AND LAMP CAPS

3.1 Bulbs

3.1.1 The shape of the bulbs shall be either tubular or spherical as indicated in Table 1.

3.1.2 The glass used for lamps shall be able to withstand thermal shocks encountered during the normal service of the lamps.

3.1.3 The overall dimensions of bulbs shall be in accordance with the values specified in Table 1.

3.2 Caps — For the aerodrome lighting, lamps given in Table 1 'P28s Cap' is used. The shape and dimensions of caps shall be as given in Appendix A.

4. REQUIREMENTS

4.1 Mechanical and Physical Requirements

4.1.1 *Bulbs* — The bulbs shall be clean, uncoloured and free from defects detrimental to service.

4.1.2 *Caps* — The caps shall be made of brass with nickel plating of the lowest grade (C Nisb Crr of IS : 4827-1968*). The caps on the finished lamps shall comply with Appendix A and are to be so constructed and attached to the bulbs that they withstand both during the inspection test and at the end of the life test, the torsional moments given in **4.1.2.1**.

4.1.2.1 *Attachment of caps to the bulbs* — Caps shall be attached to the bulbs so strongly as to comply with the torsion test carried out in accordance with **7.3** with the following torsional moments, both during the inspection tests and at the end of life test:

Type of Cap	*Torsional Moments*
P28s	30 kg.cm

4.1.3 *Solder* — Solder shall be so applied as not to interfere with the proper engagement in the holder and proper electrical contact. The solder shall withstand working temperature of 250°C.

NOTE — It is not essential that the whole surface of the eyelet should be covered with solder, provided there is good electrical contact between the lead-in wire and the eyelet, and the soldering is done with the projecting portion and the wire above the solder should not be 1 mm.

---

*Electroplated coatings of nickel and chromium on copper and copper alloys.

TABLE 1 CHARACTERISTICS OF LAMPS

(*Clauses* 3.1.1, 3.1.3, 3.2, 4.2, 4.2.1, 4.2.2, 4.3.1 *and* 4.3.2)

RATED WATTAGE	SHAPE	DIAMETER, *Max*	FILAMENT	LIGHT CENTRE LENGTH	OVERALL, LENGTH, *Max*	AVERAGE INITIAL LUMENS *Min*	AVERAGE LIFE *Min*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
W		mm		mm	mm		hours
30	Tubular	34	Inverted V	38·1 ± 0·5	101·6	400	1 000
45	Tubular	34	Inverted V	38·1 ± 0·5	101·6	650	1 000
45	Tubular	34	Axial	38·1 ± 0·5	98	620	1 000
65	Tubular	34	Axial	38·1 ± 0·5	98	1 050	1 000
65	Spherical	62	Axial	38·1 ± 0·5	95	1 160	200
100	Spherical	62	Axial	38·1 ± 0·5	95	1 930	200
200	Tubular	46	—	55·6 ± 0·8	146	4 800	75
204	Tubular	46	—	55·6 ± 0·8	146	4 200	500
200	Spherical	62	Axial	38·1 ± 0·5	95	3 960	200
210	Tubular	46	—	55·6 ± 0·8	146	4 500	300

NOTE 1 — The tolerance for initial wattage:

a) Batch ±5 percent, and
b) Individual ±10 percent.

NOTE 2 — The initial values of lumen for individual lamps shall not be less than 92 percent of the average lumen values.

NOTE 3 — It is the intention to standardize 204 and 210 watts tubular lamps and to delete 200 watts tubular lamp at an appropriate time.

4.2 Initial Rating Requirements — Initial ratings shall be in accordance with the requirements specified in Table 1. Initial photometric measurements shall be made only after an ageing period as given in **7.2**.

4.2.1 Initial wattage of batch and individual lamps shall be in accordance with values given in Table 1.

4.2.2 Initial lumens of individual lamps shall be not less than the values given in Table 1.

4.3 Life Performance Requirements — The average life, individual lamp life and the individual lumen at 50 percent ± 25 h shall comply with the requirements specified in **4.3.1** and **4.3.2**.

4.3.1 *Average Life* — Average life shall be not less than the life stated in Table 1, subject to the following allowances:

Number of Lamps in Life Test	*Percentage Allowance in Average Life**
13	12
14 to 16	11
17 „ 19	10
20 „ 22	9
23 „ 25	8

4.3.2 *Individual Lamp Requirements*

4.3.2.1 A lamp shall have a life of not less than 60 percent of the values given in Table 1 subject to the qualifying limits specified in **8.4** (b).

4.3.2.2 *Lumen maintenance* — The individual lumen maintenance shall be on percentage initial lumen measured at 50 percent ± 25 h of the nominal life given in Table 1 and shall not be less than 85 percent of its actual initial value.

NOTE — If the lamp does not comply with **4.3.2.2**, it shall be considered to have failed at 59 percent of life.

5. MARKING

5.1 Each lamp shall be distinctly and indelibly marked with the following:

a) Name of the manufacturer's and/or trade-mark,

b) Rated current,

c) Rated wattage, and

d) Country of manufacture.

5.1.1 Lamps may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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*These figures are statistical allowance to take into account the relatively small sizes of the samples taken for life tests.

6. SELECTION OF LAMPS FOR TESTS (SAMPLING)

6.1 Samples for testing shall be selected from lamps belonging to one batch.

6.1.1 *Batch Consisting of 1 000 Lamps or Less* — For batches consisting of 10 or less containers, lamps shall be selected from every container. If the batch consists of more than 10 containers, lamps shall be selected from at least one half of the total number of containers in the batch with a minimum of 10 containers.

6.1.2 *Batch Consisting of More than 1 000 Lamps* — Lamps shall be selected as far as possible from one-third of the total number of containers in the batch, with a minimum of 10 containers.

6.2 Inspection Test Quantity — Inspection test quantity shall consist of 5 percent of the batch with, however, a minimum of 35 and a maximum of 70 lamps.

6.3 Rating Test Quantity — Rating test quantity, selected from the lamps which have passed the inspection tests, shall consist of not less than 25 lamps, nor more than 50 lamps.

6.4 Life Test Quantity — Life test quantity, selected from the lamps which have passed the rating tests, shall consist of not less than 15 lamps, nor more than 25 lamps.

6.5 Spare Lamps (Breakages) — Lamps which become accidentally broken during the test shall, when necessary, be replaced to ensure that the required number of lamps complete the tests. The results obtained with the replacement lamp shall be substituted for those of the broken lamps.

7. CONDITIONS OF TESTS

7.1 Visual Examination and Checking for Mechanical and Physical Requirements — Each lamp of inspection test quantity shall be examined visually as well as checked for mechnical and physical requirements as given in **4.1** and marking requirements specified in **5**.

7.1.1 *Tolerance* — The axial error shall not exceed ± 1 mm for filament and ± 3 mm for shell.

7.2 Ageing — Before the lamps are subjected to photometric tests for the first time, they shall be aged for a period given in Table 2 at the rated current during ageing lamp shall burn with cap down.

TABLE 2 AGEING TIME FOR LAMPS

(*Clause* 7.2)

LIFE IN HOURS	AGEING PERIOD IN MIN
(1)	(2)
500 to 1 000	60
200 „ 300	30
75	15

7.3 Torsion Test — Lamps shall be inserted in a special holder having shape and dimensions as agreed and fixed to a suitable torsion testing machine and the test shall then be carried out by twisting the bulbs. The torque shall not be applied suddenly but increased gradually to the moments specified in **4.1.2.1**.

NOTE — The testing machine and facilities for tests are available with the National Test House, Alipore, Calcutta.

7.3.1 This test shall be carried out before and after life test (*see* **7.5**).

7.4 Initial Rating Tests — Measurements shall be made for initial watts and initial lumens at rated current with an integrating photometer (*see* IS : 2407-1963*). The accuracy of the ammeter and voltmeter used for the test, shall be maintained at 0·5 percent of the full scale value. The lamp shall burn in a vertical position with cap up for this test.

7.5 Life Test

7.5.1 During life test, the lamp shall burn in a vertical position with cap down.

7.5.2 *Test Current* — The lamps are to be tested on alternating current at a nominal frequency of 50 Hz/s at their rated current.

7.5.3 *Amperage Control* — The rms value of the test current is not at any time throughout the life test period to depart from the rated value by not more than 1 percent.

7.5.4 *Switching Off During Life Test* — Lamps on life test shall be switched off twice during every 24 h of burning, for periods of not less than 15 min, such periods not being considered as part of the life of the lamp.

7.5.5 *Accidentally Broken Lamps* — Lamps which are accidentally broken before the completion of the life test shall, when necessary, be replaced to ensure that the required minimum of 13 lamps complete the test. Any such broken lamps shall be neglected in calculating the results.

---

*Specification for photometric integrators.

7.5.6 For the purpose of computing average life of life test quantity, lamps operating beyond 125 percent of the specified life in the life test shall be deemed to have a life equal to 125 percent of the specified life only.

8. CONDITIONS OF COMPLIANCE

8.1 General — If any test quantity fails to satisfy any of the requirements of **8.2, 8.3** and **8.4** the batch shall be rejected and no subsequent tests shall be carried out from the batch (*see also* Appendix B).

8.2 Mechanical and Physical Requirements and Marking — A batch shall be considered to comply with the requirements of **4.1** and **5,** if the number of lamps failing does not exceed the qualifying limits given below:

Test Quantity	*Qualifying Limits*
For any single requirements	3
For all requirements taken together	5

8.3 Initial Ratings — A batch shall be considered to comply with initial rating requirements (*see* **4.2**), if the number of lamps failing does not exceed the qualifying limits given below:

Test Quantity	*Qualifying Limits*
For initial wattage of individual lamps	5
For initial lumens of individual lamps	5
For initial wattage and initial lumens of individual lamps taken together	6

8.4 Life Performance — A batch shall be considered as complying with life performance requirements (*see* **4.3**), if:

a) the average life of the life test quantity attains the value specified in **4.3.1** subject to the allowance specified therein, and

b) the number of lamps failing in respect of individual life and lumens of individual lamps at 50 percent of the nominal rated life does not exceed the qualifying limits given below:

Test Quantity	*Qualifying Limits*
13	3
14 to 20	4
21 „ 25	5

APPENDIX A

(*Clauses* 3.2 *and* 4.1.2)

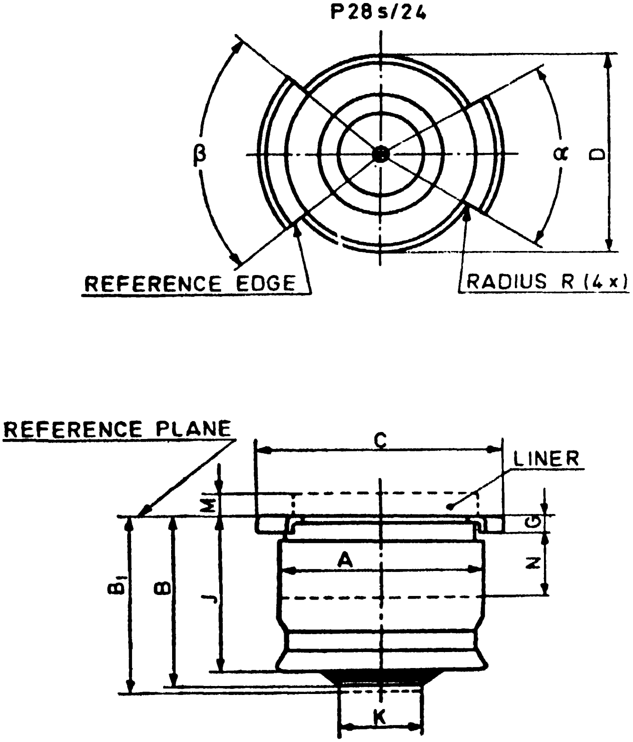
ARTICLE SHEET FOR LAMP CAP AND CAP COLLAR

A-1. LAMP CAP AND CAP COLLAR

A-1.1 Lamp Cap — The dimensions shall be as given in Fig. 1 read with Table 3.

A-l.2 Cap Collar — The dimensions shall be as given in Fig. 2.

NOTE — The dimensions given in Fig. 1 and Fig. 2 are intended only to indicate the dimensions to be controlled.



All dimensions in millimetres.

FIG. 1 LAMP CAP

TABLE 3 DIMENSIONS FOR LAMP CAPS

(*Clause* A-1.1)

All dimensions in millimetres.

DIMENSION	STANDARD DIMENSIONS			
	Unmounted Caps*		Caps on Finished Lamps	
	Min	*Max*	*Min*	*Max*
(1)	(2)	(3)	(4)	(5)
A†	27·15	27·55	27·15	27·65
A_1‡	—	27·55	—	27·65
B	23·8	24·5	—	—
B_1§	24·21	25·35	24·21	25·35
C	33·4	33·8	33·4	33·86
D	—	28·35	—	28·35
G	0·86	1·27	0·86	1·27
J	—	22·5	—	22·5
K	Approx	11	—	—
K_1	3·0	—	—	—
M	—	—	3·0	—
N†	9 0	—	9·0	—
p	1·3	—	—	—
R	— 57°30 77°30	0·25 60° 80°	— 57°30 77°30	0·25 60° 80°

NOTE 1 — These dimensions show the Indian Standard values which ensure a fit in all known existing lampholders.

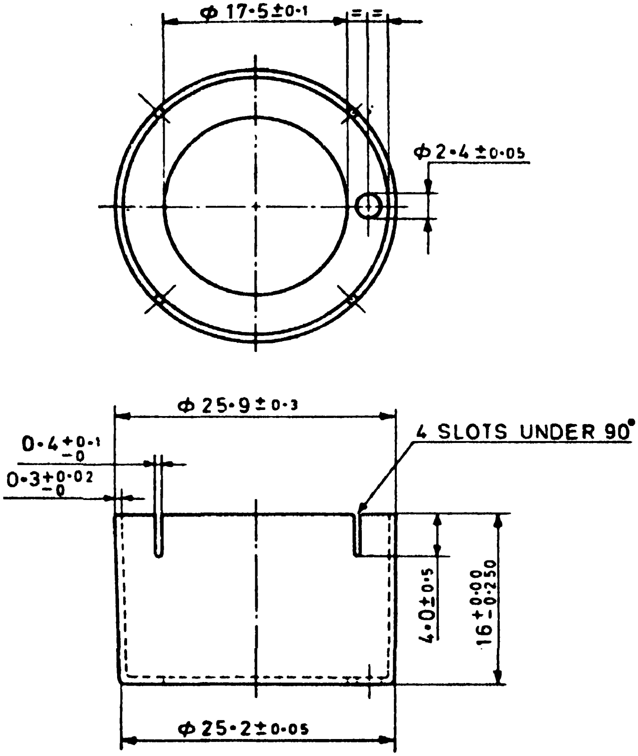
NOTE 2 — On finished lamps the creepage distance over insulation shall not be less than 3 mm.

*The values are solely for cap design and are not to be gauged unless specified otherwise.

†Dimension *N* denotes the minimum length over which both the minimum and maximum limits of dimension *A* shall be observed; below this, only the limits for *A*, *Max* apply.

‡Caps may be made with a flare the diameter of which shall not be more than 1 mm greater than the maximum permissible diameter of the corresponding cap without a flare.

§Dimension B_1 for unmounted caps applies only to caps with raised contacts.



All dimensions in millimetres.

FIG. 2 CAP COLLAR

APPENDIX B

(*Clause* 8.1)

STATISTICAL BASIS OF TEST QUANTITIES AND CONDITIONS OF COMPLIANCE

B-1. The acceptance limits given under **8.2, 8.3** and **8.4** are such that there is at least a 0·975 (39 out of 40) probability of compliance provided that the bulk of the manufacturer's production contains:

a) not more than 2 percent failing any single requirement given in **4.1** and **5** and not more than 5 percent failing the requirements combined,

b) not more than 7 percent failing the requirements for initial ratings when each is taken separately and not more than 10 percent when these requirements are combined, and

c) not more than 8 percent failing life test requirements.

(*Continued from page* 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	Steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	CONVERSION
Force	newton	N	1 N = 0·101 972 kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	Siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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